

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims

Claims 1-11 (cancelled).

Claim 12 (currently amended): A system for removing carbon monoxide from a hydrogen-containing treatment-object gas containing hydrogen as its major component and carbon dioxide, the system comprising two stages of CO removers for removing carbon monoxide, the first-stage CO remover removing a portion of the carbon monoxide by methanation thereof through a catalyst reaction by a first metal catalyst comprising one or more kinds selected from the group consisting of Ru, Pt, Rh, and Pd and capable of methanating carbon monoxide through a catalyst reaction for methanating the carbon monoxide while restricting methanation of the carbon dioxide, the second-stage CO remover removing a remaining portion of the carbon monoxide mainly by oxidation thereof through a further catalyst reaction involving addition of an oxidizing agent.

Claim 13 (currently amended): The system for removing carbon monoxide, according to claim 12, wherein:

the first-stage CO remover includes the first metal catalyst and a first catalyst reaction condition setting mechanism for maintaining at the catalyst reaction layer of the first-stage CO remover at a temperature required for methanation reaction of the carbon monoxide by the first metal catalyst and the restriction of the methanation of the carbon dioxide; and

the second-stage CO remover includes a second metal catalyst capable of oxidizing the carbon monoxide, a second catalyst reaction condition setting mechanism for maintaining a catalyst reaction layer of the second-stage CO remover at a temperature required for the oxidation reaction of the carbon monoxide by the second metal catalyst, and

an oxidizing-agent supplying mechanism for supplying the oxidizing agent required for the oxidation reaction with adjustment of the oxidizing agent addition amount.

Claim 14 (previously presented): The system for removing carbon monoxide, according to claim 12, wherein said treatment-object gas is a reformed gas obtained by reforming of fuel such as hydrocarbon, alcohol, naphtha, kerosene to be supplied as a fuel gas to a fuel cell.

Claim 15 (currently amended): A method of removing carbon monoxide from a hydrogen-containing treatment-object gas containing hydrogen as its major component and carbon dioxide, the method comprising:

a first step of causing the treatment-object gas to contact a first metal catalyst comprising one or more kinds selected from the group consisting of Ru, Pt, Rh, and Pd and capable of methanating carbon monoxide at a temperature where methanation of carbon monoxide takes place by the first metal catalyst so that a portion of the carbon monoxide is removed through carbon monoxide methanation and where methanation of the carbon dioxide is restricted; and

a second step of causing the treatment-object gas from the first step together with an oxidizing agent to contact a second metal catalyst capable of oxidizing carbon monoxide so that a remaining portion of carbon monoxide is removed mainly through carbon monoxide oxidation.

Claim 16 (previously presented): The method of removing carbon monoxide, according to claim 15, wherein in the first step, a reaction temperature of catalyst reaction between the first metal catalyst and the treatment-object gas is controlled to a temperature at which methanation of carbon monoxide may be promoted with restricting methanation of carbon dioxide, so as to reduce a carbon monoxide concentration of the treatment-object gas to approximately 50% or lower of an original carbon monoxide concentration of the treatment-object gas charged into this first step.

Claim 17 (currently amended): The method of removing carbon monoxide, according to claim 15, wherein in the second step, the second metal catalyst comprising one or more kinds selected from the group consisting of Ru, Pt, Rh and Pd is employed; and
in the second step, a catalyst reaction layer is maintained at a temperature where oxidation of carbon monoxide takes place by the second metal catalyst involving addition of an oxidizing agent.

Claim 18 (previously presented): The method of removing carbon monoxide, according to claim 15, wherein a total amount of the oxidizing agent supplied at the second step is below about 3 chemical equivalents in oxygen conversion relative to an amount of carbon monoxide originally contained in the treatment-object gas introduced in the first step.

Claim 19 (previously presented): The method of removing carbon monoxide, according to claim 15, wherein a total amount of the oxidizing agent supplied at the second step is below the chemical equivalent in oxygen conversion relative to an amount of carbon monoxide originally contained in the treatment-object gas introduced in the first step.

Claim 20 (previously presented): The method of removing carbon monoxide, according to claim 15, wherein said hydrogen-containing treatment-object gas comprises a reformed gas supplied to a fuel cell as a fuel gas.

Claim 21 (previously presented): The system for removing carbon monoxide, according to claim 13, wherein said treatment-object gas is a reformed gas obtained by reforming of fuel such as hydrocarbon, alcohol, naphtha, kerosene to be supplied as a fuel gas to a fuel cell.

Claim 22 (currently amended): The method of removing carbon monoxide, according to claim 16, wherein in the second step, the second metal catalyst comprising one or more kinds selected from the group consisting of Ru, Pt, Rh and Pd is employed; and

in the second step, a catalyst reaction layer is maintained at a temperature where oxidation of carbon monoxide takes place by the second metal catalyst involving addition of an oxidizing agent.

Claim 23 (previously presented): The method of removing carbon monoxide, according to claim 16, wherein a total amount of the oxidizing agent supplied at the second step is below about 3 chemical equivalents in oxygen conversion relative to an amount of carbon monoxide originally contained in the treatment-object gas introduced in the first step.

Claim 24 (previously presented): The method of removing carbon monoxide, according to claim 17, wherein a total amount of the oxidizing agent supplied at the second step is below about 3 chemical equivalents in oxygen conversion relative to an amount of carbon monoxide originally contained in the treatment-object gas introduced in the first step.

Claim 25 (previously presented): The method of removing carbon monoxide, according to claim 22, wherein a total amount of the oxidizing agent supplied at the second step is below about 3 chemical equivalents in oxygen conversion relative to an amount of carbon monoxide originally contained in the treatment-object gas introduced in the first step.

Claim 26 (previously presented): The method of removing carbon monoxide, according to claim 16, wherein a total amount of the oxidizing agent supplied at the second step is below the chemical equivalent in oxygen conversion relative to an amount of carbon monoxide originally contained in the treatment-object gas introduced in the first step.

Claim 27 (previously presented): The method of removing carbon monoxide, according to claim 17, wherein a total amount of the oxidizing agent supplied at the second step is below the chemical equivalent in oxygen conversion relative to an amount of carbon monoxide originally contained in the treatment-object gas introduced in the first step.

Claim 28 (previously presented): The method of removing carbon monoxide, according to claim 22, wherein a total amount of the oxidizing agent supplied at the second

step is below the chemical equivalent in oxygen conversion relative to an amount of carbon monoxide originally contained in the treatment-object gas introduced in the first step.

Claim 29 (previously presented): The method of removing carbon monoxide, according to claim 16, wherein said hydrogen-containing treatment-object gas comprises a reformed gas supplied to a fuel cell as a fuel gas.

Claim 30 (previously presented): The method of removing carbon monoxide, according to claim 17, wherein said hydrogen-containing treatment-object gas comprises a reformed gas supplied to a fuel cell as a fuel gas.

Claim 31 (previously presented): The method of removing carbon monoxide, according to claim 18, wherein said hydrogen-containing treatment-object gas comprises a reformed gas supplied to a fuel cell as a fuel gas.

Claim 32 (previously presented): The method of removing carbon monoxide, according to claim 19, wherein said hydrogen-containing treatment-object gas comprises a reformed gas supplied to a fuel cell as a fuel gas.

Claim 33 (previously presented): The method of removing carbon monoxide, according to claim 22, wherein said hydrogen-containing treatment-object gas comprises a reformed gas supplied to a fuel cell as a fuel gas.

Claim 34 (new): The method of removing carbon monoxide, according to claim 15, wherein in the first step, a reaction temperature of catalyst reaction between the first metal catalyst and the treatment-object gas is controlled to a temperature at which methanation of carbon monoxide may be promoted with restricting methanation of carbon dioxide, so as to reduce a carbon monoxide concentration of the treatment-object gas to approximately 30% or lower of an original carbon monoxide concentration of the treatment-object gas charged into this first step.

Claim 35 (new): A fuel cell system having a system for removing carbon monoxide from a hydrogen-containing treatment-object gas containing hydrogen as its major component and carbon dioxide, the system comprising two stages of CO removers for removing carbon monoxide, the first stage CO remover removing a portion of the carbon monoxide by methanation thereof through a catalyst reaction by a first metal catalyst comprising one or more kinds selected from the group consisting of Ru, Pt, Rh, and Pd and capable of methanating carbon monoxide through a catalyst reaction for methanating the carbon monoxide while restricting methanation of the carbon dioxide, the second-stage CO remover removing a remaining portion of the carbon monoxide mainly by oxidation thereof through a further catalyst reaction involving addition of an oxidizing agent and using methane produced by the first-stage CO remover as a reforming fuel.

Claim 36 (new): A method of operating a fuel cell system, where carbon monoxide is removed from a hydrogen-containing treatment-object gas containing hydrogen as its major component and carbon dioxide, comprising:

a first step of causing the treatment-object gas to contact a first metal catalyst comprising one or more kinds selected from the group consisting of Ru, Pt, Rh, and Pd and capable of methanating carbon monoxide at a temperature where methanation of carbon monoxide takes place by the first metal catalyst so that a portion of the carbon monoxide is removed through carbon monoxide methanation and methanation of the carbon dioxide is restricted;

a second step of causing the treatment-object gas from the first step together with an oxidizing agent to contact a second metal catalyst capable of oxidizing carbon monoxide so that a remaining portion of carbon monoxide is removed mainly through carbon monoxide oxidation; and

using methane produced at the first step as a reforming fuel.